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A REVISION OF THE AUSTRALIAN DEVONIAN CORALS PREVIOUSLY REFERRED TO *MICTOPHYLLUM*

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Abstract

The earliest known occurrences of *Mictophyllum* are in beds of Givetian age in the Urals and Hunan. The genus was considerably more prolific in Frasnian time and is represented by about a dozen described species from New York, Nevada, W. Canada, the Russian Platform and Hunan.

Mictophyllum has been reported on several occasions from SE. Australia in beds now known to range in age from possible late Gedinnian to Emsian. However, a reinvestigation of the corals upon which these reports are based indicates not only that none is truly *Mictophyllum*, but also that all belong to new genera.

As a result of the present revision, the taxonomy and distribution of these corals become:

Family Disphyllidae

Chalcidophyllum campanense gen. et sp. nov., Siegenian, Waratah Bay, Vict.
C. campanense var. *nanum* nov., Siegenian, Waratah Bay, Vict.
C. discorde sp. nov., Siegenian, Waratah Bay, Vict.
Disphyllum angulare and *'Campophyllum' recessum* from Emsian beds at Buchan, Vict., and Siegenian beds on Murrumbidgee R., N.S.W., are also referred to the new genus.

Family Bethanyphyllidae

Strathmoelasma amplum gen. et sp. nov., late Emsian or early Eifelian, Sulcor, N.S.W.

Family Stereotophyllidae nov.

Stereotophyllum cresswelli (Chapman), Siegenian, Lilydale, Vict.
S. vallatum nom. nov., late Gedinnian or Siegenian, Tyers R., Vict.
Dohmophyllum pridianum from late Gedinnian or Siegenian beds on Tyers R., Vict., is also referred to *Stereotophyllum*.
Loomberaphyllum pustulosum gen. et. sp. nov., late Emsian or early Eifelian, Loomberah and Sulcor, N.S.W.
L. impensum nom. nov., late Gedinnian or Siegenian, Tyers R., Vict.

Family Cyathophyllidae

Cavanophyllum trochoides (Hill), Siegenian, Murrumbidgee and Goodradigbee R., N.S.W.

Introduction

The genus *Mictophyllum* was proposed by Lang and Smith (1939, p. 155) for a Frasnian coral from the NW. Territories of Canada. On several occasions subsequently the genus has been identified in both Victoria and New South Wales.

In Victoria, the reported occurrences are in the Lilydale Limestone at Lilydale (Hill 1939a, p. 246), the Bell Point Limestone at Waratah Bay (Hill 1954b, p. 109, 110), and in a limestone within the Coopers Creek Formation on Tyers R. (Philip 1962, p. 180). Hill believed the Lilydale Limestone to be 'older than Upper Devonian' and the Bell Point Limestone to be possibly Couvinian. Philip, however, regarded his specimen from Tyers R. as being 'early Lower Devonian'.

In New South Wales, corals referred to *Mictophyllum* have been described from the Cavan Bluff Limestone near Taemas (Hill 1940, p. 265) and the Suleor Limestone near Attunga (Hill 1942b, p. 144). It was thought that the first is 'somewhere near the base of the Couvinian or perhaps the top of the Coblenzian' and that the second is early Couvinian.

During the quarter of a century that has elapsed since the first of these reports

of the genus in Australia, much new information concerning the composition and distribution of Devonian coral faunas in various parts of the world has become available. Of particular interest from the Australian point of view has been the publication of works describing faunas in the Urals, the Kuznets Basin, and Asia. Also in recent years, correlations of some of the best-known Australian Devonian successions have been modified (Philip 1960; Philip and Pedder 1964). It is now clear that the temporal interval between the overseas occurrences of *Mictophyllum* and those of the Australian species referred to the genus, is greater than was previously realized.

Field-work recently undertaken by G. M. Philip and the writer, as a step towards elucidation of the Devonian correlation problems in SE. Australia, has provided opportunities for acquiring additional specimens of most of the Australian species. The present work is in two parts. Firstly, *Mictophyllum* and other superficially similar genera are reviewed and secondly, the systematics of the Australian species are revised.

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Systematic Descriptions

Fossil collections are symbolized as follows:

AM—Australian Museum, Sydney
GSV—Geological Survey of Victoria, Melbourne
NMV—National Museum of Victoria, Melbourne
UM—University of Melbourne, Melbourne
UNE—University of New England, Armidale
UQ—University of Queensland, Brisbane
US—University of Sydney, Sydney.

Family Disphyllidae Hill

Genus **Mictophyllum** Lang and Smith

1939 *Mictophyllum* Lang and Smith, p. 155.
1958 *Disphyllum* (*Sinodisphyllum*) Sun, p. 11, 12.

Type Species (of *Mictophyllum*): *M. nobile* Lang and Smith 1939, p. 155, Pl. 4, fig. 1. Beds now (Belyca and McLaren 1962) referred to the late Frasnian Redknife Formation, Redknife R., NW.T., Canada.

Type Species (of *Sinodisphyllum*): *S. variabile* Sun 1958, p. 12, Pl. 4, fig. 1, 2; Pl. 5, fig. 1; Pl. 6, fig. 1. Lungkouchung Formation (Frasnian), Hsianghsiang, Hunan, China.

Remarks: The type species of *Sinodisphyllum* is greatly more representative of the genus than is the type species of *Mictophyllum*. *M. variabile* is a medium sized ceratoid to subcylindrical coral with slightly dilated and radially arranged septa. Development of the minor septa is variable and a herringbone dissepimentarium may be present. It is said that the trabeculae are disphyllid. The dissepiments are numerous, relatively small, and commonly inosculate. The tabulae may be

short or long in longitudinal section and peripherally may be down-turned, upturned or simply abut against another tabula or dissepiment. There is a trend in the genus towards suppression of the minor septa and development of a herringbone dissepimentarium. *M. nobile* is a late species very near the end of this trend and, consequently, is almost devoid of minor septa.

In the past, species of the genus have been referred to a number of genera, including *Aulacophyllum, Campophyllum, Cyathophyllum,* and *Tabulophyllum.*

Aulacophyllum is distinct for several reasons, the most obvious being that the septa are radially arranged in *Mictophyllum,* whereas they are pinnate about the cardinal septum in *Aulacophyllum.* The dilation of the septa, if present is also different, and in *Aulacophyllum* the dissepiments are not normally inosculating.

Birenheide (1963, p. 376) has recently revised *C. dianthus,* the type species of *Cyathophyllum,* and has shown it to be a compound coral in which the septa are zigzagly carinate and tend to become diffuse peripherally.

Cyathophyllum flexuosum Goldfuss, the type species of *Campophyllum,* was probably wrongly located in the original description and is believed to be a Carboniferous species. The type material has never been adequately described and, according to Mensink (in Semenoff-Tian-Chansky 1962, p. 298), was probably destroyed in Berlin during World War II. With such circumstances the genus is obviously unusable but, in any case, it is generally held to be close to either *Palaeosmilia* or *Caninia* (Lang, Smith, and Thomas 1940, p. 30).

Tabulophyllum is a variable genus and a few of its species approach *Mictophyllum.* However, the similarity is superficial as *Tabulophyllum* has a very different skeletal structure (Pedder 1965, Fig. 2). Most species of *Tabulophyllum* possess lonsdaleoid dissepiments and therefore do not simulate *Mictophyllum.*

The known distribution of *Mictophyllum* is summarized thus:

Givetian, Urals

Campophyllum litvinovitschae Soshkina 1952, p. 88, 89, Pl. 23, fig. 87 (the earlier, 1949 reference is not available to the present author).

Givetian, Asia

Campophyllum lindstroemi Ma 1956, Pl. 32, fig. 1-4; Pl. 33, fig. 1, 2. Hsianghsiangsien, Hunan.

Frasnian, Asia

Tabulophyllum curvatum Sun 1958, p. 10, 11, Pl. 1, fig. 4, 5. Hsianghsiang, Hunan.
Disphyllum cylindricum Sun in Wang et al. 1957, p. 32, Pl. 12, fig. 5, 6, 9; Sun 1958 (as *Sinodisphyllum*), p. 10, Pl. 1, fig. 3. Hsianghsiang, Hunan.
Ptychophyllum giganteum Sun in Wang et al. 1957, p. 35, Pl. 14, fig. 4, 5; Sun 1958 (as *Tabulophyllum*), p. 11, Pl. 2, fig. 1; Pl. 3, fig. 1, 2. Hsianghsiang, Hunan.
Sinodisphyllum simplex Sun 1958, p. 12, 13, Pl. 5, fig. 2, 3; Pl. 6, fig. 2. Hsianghsiang, Hunan.
Sinodisphyllum variable Sun 1958, p. 12, Pl. 4, fig. 1, 2; Pl. 5, fig. 1; Pl. 6, fig. 1. Hsianghsiang, Hunan.

Frasnian, North America

Mictophyllum modicum Smith 1945, p. 32, 33, Pl. 5, fig. 1-6; Pl. 7, fig. 8; McLaren et al. 1961, Pl. 5, fig. 3-5. Upper Mackenzie Valley and Hay River.
Mictophyllum near *modicum* Smith 1945, p. 33, Pl. 5, fig. 7, 8. Upper Mackenzie Valley.
Mictophyllum multiseptatum Smith 1945, p. 33, 34, Pl. 5, fig. 9. Upper Mackenzie Valley.
Mictophyllum nobile Lang and Smith 1939, p. 155, Pl. 4, fig. 1; Smith 1945, p. 30, 31, Pl. 4, fig. 1. Upper Mackenzie Valley.
Mictophylllum semidilatum Smith 1945, p. 31, 32, Pl. 4, fig. 2, 3. Upper Mackenzie Valley.
Cyathophyllum sp. c, Merriam 1940, Pl. 14, fig. 3. Devils Gate, Nevada.
Mictophyllum orientale Stumm 1960, p. 162, Pl. 30, fig. 1-3. Tioga County, New York.

Frasnian, Europe

Aulacophyllum ornatum Soshkina 1952, p. 68, 69, Pl. 3, fig. 13; 1954, p. 27-30, fig. 3, 4, Pl. 2, fig. 1-5; Pl. 3, fig. 1, 2. Russian Platform.

Genus **Chalcidophyllum** nov.

NAME DERIVATION: Gk. χαλκίς = herring-like fish, and φύλλον = leaf.

TYPE SPECIES: *Chalcidophyllum campanense* sp. nov., see below.

DIAGNOSIS: Corallum weakly compound; corallites trochoid to cylindrical. Epitheca deeply invaginated at the septa giving rise to prominent septal grooves. Septa smooth, thin, radially arranged, typically highly differentiated into two orders and in some cases the minor septa are almost completely suppressed. Dissepiments numerous in large species, relatively less numerous in small species, inosculating and in some species forming a herringbone dissepimentarium. At the periphery they are small, but become larger and more elongate towards the tabularium. Tabulae broad and typically depressed axially.

ADDITIONAL SPECIES ASSIGNED: *Disphyllum angulare* Hill 1950, p. 141, 142, Pl. 6, fig. 10. Murrindal Limestone (Emsian) (Philip and Pedder 1964), Buchan, Vict.

Chalcidophyllum discorde sp. nov., see below.

'Campophyllum' recessum Hill 1940, p. 254-256, Pl. 9, fig. 7. Currajong Limestone (Siegenian) (Philip and Pedder 1964); Murrumbidgee R., N.S.W.

REMARKS: The species for which *Chalcidophyllum* is being erected have previously been referred to either *Campophyllum, Breviphyllum, Disphyllum,* or *Mictophyllum.*

Since *Campophyllum* had been shown to be an unusable Carboniferous genus, Stumm (1949, p. 25) erected *Breviphyllum* for the Devonian species that had been placed in it. However, as used, *Campophyllum* was polyphyletic, some species such as *C. yunnanense* Reed (1927, p. 10, Pl. 1, fig. 6-11) are probably streptelasmatids, whereas others (Wedekind 1925, Pl. 16, fig. 97-99; Yoh 1937, p. 61, Pl. 7, fig. 5, 6) are disphyllids. If species such as *Breviphyllum mons* Clauss (1956, p. 20, Fig. 4), which is probably a polycoeliid, are included, the genus becomes even more polyphyletic. *Amplexus lonense* Stumm (1937, p. 428, Pl. 53, fig. 4; Pl. 54, fig. 4), the type species of *Breviphyllum,* is an Emsian (House 1962, p. 252, 253; Johnson 1962) coral from Nevada. It is trochoid and has short peripherally dilated septa, flat complete tabulae and a few large irregular dissepiments. Species of *Chalcidophyllum* are distinguished from it by their growth form, long, peripherally thin septa, narrower, axially sagging tabularium, and by their smaller, more numerous dissepiments.

Mictophyllum resembles *Chalcidophyllum* but is distinguished by its growth form and by the relationship of its septa to the wall, which is not invaginated to form prominent septal grooves. Although both genera appear to have evolved from the disphyllinid stock, they probably did so independently. *Chalcidophyllum* is confined to the Siegenian and early Emsian of Australia and is evidently a small endemic genus. *Mictophyllum,* on the other hand, is apparently a widespread Givetian and Frasnian genus.

Chalcidophyllum campanense sp. nov.

(Pl. 30, fig. 2, 6-12; Pl. 34, fig. 2)

1954b *Mictophyllum cresswelli* (Chapman) Hill, p. 109, Pl. 7, fig. 8.
non 1925 *Cyathophyllum cresswelli* Chapman, p. 111, 112, Pl. 13, fig. 11-14.

NAME DERIVATION: L. *campana* = bell, hence *campanensis* from Bell Point.

MATERIAL: Holotype, UNE F8786. Paratypes 1-5, UNE F8787-8791. All were obtained from the Bell Point Limestone (Siegenian), immediately N. of Bell Point,

Waratah Bay, Vict. The specimen described by Hill (1954b) is UQ F17134 and is an approximate topotype.

DIAGNOSIS: Corallum weakly compound; corallites trochoid to subcylindrical and up to 35 mm in diameter. Septa radially arranged, highly differentiated into two orders, numbering from about 30 × 2 to 37 × 2 in adult corallites. Dissepiments numerous, forming a wide herringbone dissepimentarium. Tabulae broad, but incomplete, sloping so that the tabularium is depressed axially.

DESCRIPTION: At the type locality the corallites are close and abundant, but only rarely are connections seen between them. In early stages they are trochoid to ceratoid, but later may become subcylindrical; their adult diameter is from about 30 to 35 mm. The exterior bears deep septal grooves as well as fine horizontal growth lines and coarser rugae. The only calice seen is subconical and about 12 mm deep.

The wall is confluent with the septa and consequently is only about one-half the width of the septa at their periphery.

The septa are radially arranged, smooth and highly differentiated into two orders. Septal counts are as follows (measurements in mm):

Specimen	Mean diameter	No. of septa
UNE F8787	19	36 × 2
UNE F8790	20	33 × 2
UNE F8788	24	31 × 2
UNE F8791	30	30 × 2
UNE F8788	32	33 × 2
UNE F8787	33	37 × 2
UNE F8788	35	31 × 2

For a short but variable distance inside the wall, the septa are thickened about a median dark lamella, which is invaginated axial plate (Flower 1961, p. 28). The major septa may extend to the axis or terminate up to 8 mm from it; in places (UNE F8788) they are discontinuous. The minor septa are normally confined to the periphery of the dissepimentarium, abnormally they are well developed, and in one part of the holotype are 9 mm long. The trabeculae are directed upwards and inwards at about 45°.

The dissepiments, which are generally small relative to the size of the coral, are arranged to form a wide herringbone dissepimentarium; in transverse section they tend to be globular or even rhomboid towards the periphery, but become more elongate towards the tabularium.

The tabulae are broad but not complete. Marginally they may abut against a dissepiment or grade into long steep tabellae. In fully orientated longitudinal sections there is a marked axial sag in the tabularium and the division between the tabularium and dissepimentarium is distinct.

COMPARISON: The species is the largest known of the genus and is unlikely to be confused with others.

Chalcidophyllum campanense var. **nanum** nov.
(Pl. 30, fig. 1, 3-5)

? 1954b *Mictophyllum* sp., Hill, p. 109, 110, Pl. 7, fig. 10.
? 1956 *Campophyllum isactis* (Frech) Ma (*pars*), p. 46. Waratah Bay specimens only.
non 1886 *Cyathophyllum isactis* Frech, p. 75, 76, Pl. 1 (13), fig. 7; Pl. 2 (14), fig. 13-18.

NAME DERIVATION: L. *nanus* = dwarf.

MATERIAL: Paratypes 6-8, UNE F8792-8794. All from the Bell Point Limestone (Siegenian), immediately N. of Bell Point, Waratah Bay, Vict. The specimen figured by Hill (1954b) is UM 2023 and comes from a limestone (probably Siegenian) SE. of Hughes Jetty, Waratah Bay, Vict.

DIAGNOSIS: A variety of *Chalcidophyllum campanense* distinguished by its narrower (up to 20 mm in diameter) and more cylindrical corallites and by its slightly fewer (up to 30 × 2) septa.

COMPARISONS: The dimensions and septal counts of this variety are the same as those of *C. angulare*. In *C. campanense* var. *nanum*, however, the dissepimentarium is more uniform and the tabularium narrower.

Chalcidophyllum discorde sp. nov.

(Pl. 30, fig. 14, 15; Pl. 34, fig. 1)

? 1940 Gen. et sp. indet., Hill, Pl. 9, fig. 9.
1954b *Mictophyllum cresswelli* (Chapman) var. *cylindricum* Hill, p. 109, Pl. 7, fig. 9.
non 1925 *Cyathophyllum cresswelli* Chapman, p. 111, 112, Pl. 13, fig. 11-14.

NAME DERIVATION: L. *discors* = different.

MATERIAL: Holotype UNE F8795. Bell Point Limestone (Siegenian), immediately N. of Bell Point, Waratah Bay, Vict. Paratype (Holotype of var. *cylindricum*), UM P4. Bell Point Limestone, Bell Point, Waratah Bay, Vict.

The specimen figured by Hill (1940) is AM F9909; it was collected at Cavan, Murrumbidgee R., N.S.W. and is likely to have been obtained from Siegenian beds.

DIAGNOSIS: Corallum probably weakly compound; corallites ceratoid at first becoming cylindrical later. At maturity the diameter of the corallite is about 20 mm and there are about 29 × 2 septa. Dissepiments numerous but variable. The tabularium consists of an outer zone of inosculating tabellae and an inner region of generally flat tabulae.

DESCRIPTION: The corallite constituting the holotype is surrounded by several others and it is probable that the corallum is weakly compound. Individual corallites are ceratoid to subcyclindrical with a maximum diameter of at least 22 mm. One longitudinal section shows several constrictions of the corallite; otherwise little is known of the exterior.

The wall is confluent with the peripheral ends of the septa and bears prominent septal grooves resulting from invaginations of the axial plate. Wall thickness at maturity is about 0·3 or 0·4 mm.

Septa are radial in arrangement, smooth, and well differentiated into two orders; they number from 27 × 2 to 31 × 2 in adult stages and are typically a little dilated in the dissepimentarium. The major septa may extend almost to the axis, but more commonly are withdrawn 2 or 3 mm from it. In the larger transverse section of the holotype they are again dilated in a concentric zone within the tabularium. This is likely to be due to an impending rejuvenescense. The minor septa are variably developed; normally they are from one-quarter to one-half the length of the major septa; in places they are discontinuous.

The dissepimentarium at the adult stage is from 3 to 5 mm wide and consists of numerous dissepiments of discrepant size and shape. There is a tendency for the dissepiments to inosculte and in places they are invested by thin sclerenchyme, which is confluent with the septa.

Two regions are discernible in the tabularium. The outer consists of cystose, typically inosculating tabellae, which may be either convex upwards, or be so

inclined as to grade into dissepiments. The inner region consists of tabulae, which may be flat, rather than sagging as in other species of the genus.

REMARKS: The provisions of the International Code of Zoological Nomenclature do not apply to infrasubspecific taxa (Articles 1 and 45c). Although it would be possible to elevate Hill's varietal name *cylindricum* to species rank (Article 10b), it is not completely beyond doubt that the holotype of the variety, in fact, is conspecific with the holotype of the new species. For this reason, and also because the holotype is a ceratoid coral, the name *cylindricum* is abandoned.

Family BETHANYPHYLLIDAE Stumm emended

Stumm (1949, p. 17) believed that the Acanthophyllidae evolved from the Zaphrentidae by gradual development of dissepiments and loss of the cardinal fossula. Several genera, both with and without yard-arm carinae, were considered to be intermediate between the zaphrentids and the acanthophyllids and were placed in a new family, the Bethanyphyllidae. It is now generally agreed that the acanthophyllids are not closely related to the other families and *Bethanyphyllum* is usually placed in the Zaphrentidae. In her last work, Soshkina (in Orlov 1962) became the only recent author to recognize the Benthanyphyllidae. However, her interpretation of the family was excessively broad and several of the 14 genera included in it are unrelated.

As presently emended, the family accommodates *Bethanyphyllum, Ceratophyllum, Moravophyllum, Tortophyllum,* and the new genus *Stathmoelasma.* In these genera the corallum is simple, the septa are smooth, or only weakly carinate and the cardinal septum is shorter than the neighbouring major septa. The absence of yard-arm carinae distinguishes the Bethanyphyllidae from the Zaphrentidae. It is possible that the family was derived from the Halliidae.

Genus **Stathmoelasma** nov.

NAME DERIVATION: Gk σταθμός = pillar, and ἔλασμα = plate.

TYPE SPECIES: *Stathmoelasma amplum* sp. nov., see below.

DIAGNOSIS: Corallum large, ceratoid to cylindrical. Epitheca thin. Septa radially arranged, smooth, thin, numerous and well differentiated into two orders; cardinal septum shorter than neighbouring major septa. Dissepiments small, forming a broad dissepimentarium. Tabularium with peripheral tabellae and broad, domed or peripherally downturned tabulae.

SPECIES REQUIRING FURTHER STUDY: *Cyathophyllum cailliaudi* Barrois 1889, p. 47-49, Pl. 2, fig. 2. Calcaire d'Erbray (Emsian, according to Péneau 1962), France.

Cyathophyllum? lonense Stumm 1937, p. 435, Pl. 55, fig. 3. Nevada Limestone (Emsian part), Nevada.

COMPARISONS: Several American species are now referred to *Bethanyphyllum.* Early forms from the Emsian of Nevada and Ohio (Stumm 1937, Pl. 54, fig. 9; Pl. 55, fig. 1, 2; Stewart 1938, Pl. 6, fig. 1, 2) have an obvious cardinal fossula and broad, somewhat sagging tabulae. Later forms from the Givetian of Michigan (Stumm 1963, Pl. 5, fig. 3, 4; Pl. 7, fig. 5-8) have a less obvious fossula and arched tabellae. Comparatively little is known of the type species, *Cyathophyllum robustum* Hall (1877, Pl. 22, fig. 1-14) from the Givetian of New York, as there is no description of topotype material. The described later forms resemble *Tortophyllum* more than *Stathmoelasma* and are easily distinguished by their very different

tabularium. The early forms are less distinct, but have a more prominent fossula and a slightly different tabularium.

Moravophyllum Kettnerova (1932, p. 29) from the Givetian of Czechoslovakia resembles *Stathmoelasma* in possessing a large cylindrical corallum, numerous long smooth septa and a shortened cardinal septum. In *Moravophyllum*, however, the septa are pinnately arranged in adult stages and the tabularium consists of convex tabellae apparently sloping towards the cardinal septum.

It is impossible to provide a definite statement on the differences between *Stathmoelasma* and *Ceratophyllum* Gürich (1896, p. 193) as *C. typus* (= *Cyathophyllum ceratites* Frech 1886), the type species of Gürich's genus, almost certainly includes more than one species. One of these (Frech 1886, Pl. 5 (17), fig. 4) has yard-arm carinae and, therefore, is not conspecific with *Stathmoelasma*; some of the others are less dissimilar but have a narrower dissepimentarium of more elongate dissepiments and have differently shaped tabulae.

There are several similarities between *S. amplum* and the American Givetian species *Tortophyllum milleri* Pittrat (1962, p. 1158, 1159, Pl. 158, fig. 7-10). However, most species of *Tortophyllum*, including the type *Zaphrentis cystica* Winchell (1866, p. 90), have a characteristic axial structure formed of inclined tabellae and long variably rotated septa (Sloss 1939, Stumm 1963).

Stathmoelasma amplum sp. nov.

(Pl. 31, fig. 1-5)

NAME DERIVATION: L. *amplus* = large.

MATERIAL: Holotype, UNE F8778. Paratypes 1-3, UNE F8779-8781. All were collected from the upper beds of the Sulcor Limestone (late Emsian, or possibly Eifelian) at the N. end of the Sulcor outcrop in Portion 249, Parish of Burdekin, County Inglis, N.S.W.

DIAGNOSIS: Corallum subcylindrical, large, up to 65 mm in diameter and more than 100 mm in length. Septa radially arranged, smooth, withdrawn axially and numbering from 52 × 2 to 60 × 2 at maturity; cardinal septum shorter than other major septa. Dissepiments relatively small and numerous. Tabulae broad and typically downturned at their periphery.

DESCRIPTION: Specimens in which the apical part of the corallum is preserved have not been collected. In adult stages the corallum is cylindrical and large, with a diameter of from 55 to 65 mm and a length of more than 100 mm. Details of the exterior are not available, but the dissepiments suggest that the calice is steep-sided and that there is no peripheral platform.

The epitheca is thin and, although it has perished in some of the types, it was probably originally entire.

The septa are smooth, radially arranged, and differentiated into two orders; in places they are discontinuous but, otherwise, are well developed.

Septal counts are as follows (measurements in mm):

Specimen	Mean diameter	No. of septa
UNE F8781	50	52 × 2
UNE F8778	58	54 × 2
UNE F8780	62	60 × 2
UNE F8779	63	60 × 2

The cardinal septum is shorter than the other major septa, which terminate from about 5 to 8 mm short of the axis. The minor septa typically extend one-half the distance to the axis and only just project into the tabularium.

Typically the dissepimentarium is from 8 to 15 mm wide. The dissepiments are relatively small and numerous and in transverse section tend to be rhomboid. In spite of the large size of the coral there are no lateral dissepiments.

The tabularium is one-half, or more, of the total width of the coral and consists of peripheral tabellae and central tabulae. The latter are broad and commonly are downturned peripherally.

REMARKS: Although this species has never been referred to *Mictophylllum*, it is introduced here because of its superficial similarity to *Loomberaphyllum postulosum* described below. Both occur in the Suleor Limestone. The septa in *S. amplum* are shorter and they are neither dilated nor split peripherally as they are in *L. pustulosum*. The tabularium in the two species is also different; in *L. pustulosum* it consists entirely of small arched tabellae, whereas in *S. amplum* both peripheral tabellae and axial tabulae are present.

Family STERICTOPHYLLIDAE nov.

TYPE GENUS: *Sterictophyllum* nov., see below.

DIAGNOSIS: Corallum solitary, large, typically slightly elliptical in transverse section. Although there is no fossula, some, or all of the protosepta may be shorter than other major septa; carinae absent, or if present not of the yard-arm type. Trabeculae parallel, almost straight, and inclined at a low angle to the horizontal. Dissepiments small; dissepimentarium broad. A septa sterozone is present in some species. Except in the most primitive species, the tabularium consists of small arched tabulae, or tabellae, and tends to be broadly domed centrally.

REMARKS: The family is proposed for the new genera *Sterictophyllum* and *Loomberaphyllum*. These cannot be accommodated in the Zaphrentidae because of differences in the tabularium and their lack of yard-arm carinae. Nor does there seem to be a close phylogenetic relationship between them and early cyathophyllids such as *Tipheophyllum*. In the Bethanyphyllidae the tabularium is different and, although the cardinal septum is shortened, other protosepta are inconspicuous.

As with other families of Lower Devonian corals, the origin of the Sterictophyllidae is obscure and presumably will remain so until the very large gap that exists in our knowledge of late Silurian and early Devonian coral faunas is filled. The earliest known member of the family is probably an early Gedinnian species identified as *Phaulactis*, and indeed it is possible that the family was derived from the Halliidae.

Genus **Sterictophyllum** nov.

NAME DERIVATION: Gk στερικτός = firmly set, and φύλλον = leaf.

TYPE SPECIES: *Cyathophyllum cresswelli* Chapman, see below.

DIAGNOSIS: Corallum large, solitary, trochoid to cylindrical and elliptical in transverse section. Septa radially arranged, differentiated into two orders, faintly to moderately carinate and commonly sufficiently dilated peripherally to form a stereozone. Trabeculae fairly straight and set at a very low angle to the horizontal. Dissepiments numerous and relatively small. Tabularium in primitive species irregularly domed periaxially and composed of short arched tabulae; in advanced species the tabularium is elevated centrally and composed of arched tabellae.

Additional Species Assigned: *Dohmophyllum pridianum* Philip 1962, p. 187, 188, Pl. 28, fig. 8, 9. Limestone in the Coopers Creek Formation (late Gedinnian, or Siegenian), Viet.

Sterictophyllum vallatum nom. nov. Oeeurrenee as above.

Species Requiring Investigation: *Cyathophyllum ungeri* Peneeke 1894, p. 599, Pl. 8, fig. 9, 10. Barrandei-Sehiehten (Emsian) Austria.

Cyathophyllum sp., Merriam 1940, Pl. 12, fig. 2. *Pinyonensis* zone, Nevada Formation (Emsian aeeording to Johnson 1962; House 1962, p. 252), Nevada.

Phaulactis cyathophylloides Bulvanker 1958 (*non* Ryder), Pl. 3, fig. 2. Tomehumyseh Beds, Chumysh R., Kuznets Basin, USSR. Russian workers have not been in agreement on the age of the Tomehumyseh Beds; Rzhonsnitskaya (1962) regards them as both Upper Silurian and Lower Gedinnian.

Tabulophyllum bifurcatum Soshkina 1939, p. 41, 42, 57, 58, Pl. 11, fig. 87, 88. Upper part of the limestones eovering the Pashia ore-bearing beds (Frasnian), Middle Urals.

Comparisons: The type speeies was originally referred to *Cyathophyllum* and later removed to *Mictophyllum*. From *Cyathophyllum, Sterictophyllum* is distinguished by its solitary form and by the different arrangement of its trabeculae. Differenees between *Mictophyllum* and *Sterictophyllum* are less obvious. In *Sterictophyllum* septal dilation is peripheral, whereas in *Mictophyllum* it is eommonly at the inner margin, or middle part of the dissepimentarium and only very rarely is it peripheral. The trabeeulae are not as flat in *Mictophyllum*, nor is the axial or periaxial elevation of the tabularium as marked as it is in *Sterictophyllum*. Reduetion of the minor septa and eonsequent development of a herringbone dissepimentarium, whieh is typieal in *Mictophyllum*, is rare in *Sterictophyllum* and, finally, there is a different relationship between the septa and the epitheea in the two genera.

One of the speeies referred to the new genus was originally plaeed in *Dohmophyllum* Wedekind (1923, p. 29, 35). Although the typieal spongophyllid (*sensu* Pedder 1964) tabularium may be modified axially in Wedekind's genus, it is still fundamentally spongophylloid. *Dohmophyllum* is further distinguished by is steeply inelined trabeeulae, rhopaloid septa, and feebly developed epitheea.

The genus *Briantia* Barrois (1889, p. 45), based on *B. repleta* from the Caleaire d'Erbray (Emsian aeeording to Péneau 1962), Franee, resembles *Sterictophyllum* in some respeets. However, the stereozone in *Briantia* oeeupies the entire marginarium and the trabeeulae are said to be rhabdaeanthine (Hill 1956b, p. 277).

Briantelasma Oliver (1960a, p. 89), with *B. americanum* an Ameriean Gedinnian speeies as its type, is another genus resembling *Sterictophyllum*. It is distinguished by having a more extensive stereozone and a weak eardinal fossula. In a subsequent diagnosis, Oliver (1960b, p. 6) stressed the importanee of a pinnate septal arrangement in *Briatelasma*.

Chalcidophyllum, proposed earlier in this paper, differs from *Sterictophyllum* in its weakly aggregate growth form and axially sagging tabularium.

The figure of *Charactophyllum nanum*, the type speeies of *Charactophyllum* Simpson (1900, p. 209, 210), given by Stumm (1949, Pl. 12, fig. 11), suggests a similarity between that genus and *Sterictophyllum*. The prineipal differenees between the genera are that, in *Charactophyllum*, septal dilation is axial rather than peripheral (Watkins 1959, Pl. 16, fig. 13-16) and the trabeeulae are an entirely different shape (Wang 1950, Pl. 7, fig. 44).

Many solitary corals with peripherally dilated septa have been placed in *Temnophyllum* Walther (1928, p. 120). The trabeculae are dissimilar in several of these species and, as Wang (1948, p. 13) has pointed out, the genus is polyphyletic. The type species of *Temnophyllum* and its synonym *Temeniophyllum* Lang, Smith, and Thomas (1940, p. 131) is *T. latum* Walther (1928, p. 123, 124, Fig. 14). No description is available of the fine structure in topotypic material of the species; however, trabeculae have been described in a specimen from Devon (Middleton 1959, p. 155). In this specimen they are inclined inwards and upwards at between 10° and 30° to the horizontal and are not divergent. In species referred to *Temnophyllum* from the Middle Devonian of China and W. Australia (Yoh 1937, Wang 1948, Wang and Lee 1948, Hill 1954a) the trabeculae are not only more erect, and curved or divergent in the plane of the septum, but may also deviate from this plane. These species are further distinguished from *Temnophyllum sensu stricto* by their incompletely developed stereozone. Similar corals have also been described under other generic names. Among these are *Charactophyllum antiquum* Soshkina 1949, 1951, 1962 and *Cyathophyllum heterophylloides* Frech 1885, Reed 1922. It seems desirable that a new genus, or genera, be erected for all these species, but this is beyond the scope of the present work.

Although *Temnophyllum* has been listed in faunas from E. Australia (Hill in Hill and Denmead 1960, p. 151) and Nevada (Merriam 1963, p. 53), occurrences supported by description, or figures, are confined to Devon (Middleton 1959), the Eifel (Ma 1956, Pl. 6, fig. 1, as *Campophyllum*), the Harz Mountains (Walther 1928), the Urals (Soshkina 1951), and perhaps Algeria (Semenoff-Tian-Chansky 1961). The Algerian occurrence is probably Givetian but may be Frasnian; the others are Givetian.

Sterictophyllum and *Temnophyllum* are most easily distinguished by the nature of their sterozone and the tabularium. In *Sterictophyllum*, the stereozone is exterior to the dissepimentarium whereas, in *Temnophyllum*, it is developed in the dissepimentarium and may completely obscure the dissepiments. The tabulae in *Sterictophyllum* are elevated either axially or periaxially but, in *Temnophyllum*, the tabularium is normally depressed axially.

Sterictophyllum cresswelli (Chapman 1925)

(Pl. 32, fig. 1-7, 11; Pl. 33, fig. 1-6; Pl. 34, fig. 3, 4)

1925 *Cyathophyllum cresswelli* Chapman, p. 111, 112, Pl. 13, fig. 11-14.
1939a *Mictophylllum cresswelli* (Chapman) Hill, p. 246-248, Pl. 14, fig. 7-11.
non 1942b *Mictophyllum* cf. *cresswelli* Hill, p. 159, Pl. 3, fig. 9 (= *Loomberaphyllum pustulosum*).
1954b *Mictophyllum cresswelli* Hill, p. 109, Pl. 7, fig. 8 (= *Chalcidophyllum campanense*).
non 1962 *Mictophyllum* sp. aff. *M. cresswelli*, Philip, p. 180, Pl. 23, fig. 3, 4 (= *Sterictophyllum vallatum*).

MATERIAL: Holotype NMV P 1267 and P 1270 (pieces separately numbered). Paratype, NMV P 1271. Hypotypes, AM F1242, NMV P 22988-22992, P 22994, P 22998, P 23000, P 23001, P 23007. All these specimens were collected from the Lilydale Limestone (Siegenian) at Cave Hill, Lilydale, Vict.

DIAGNOSIS: Corallum ceratoid to cylindrical in adult stages, with a known maximum diameter of 34 mm. Septal stereozone present in some individuals. Septa radially arranged and in mature specimens numbering from about 33 × 2 to 39 × 2. Trabeculae nearly flat. Dissepiments numerous. Tabularium with marginal tabellae and short, commonly periaxially domed tabulae.

DESCRIPTION: The corallum is simple and according to Hill (1939a, p. 246) at first may be patellate and curved. The early stages are not preserved in any of

the specimens seen by the writer; in later stages the corallum is invariably ceratoid to subcylindrical and is essentially erect rather than curved. Transverse sections commonly are just elliptical and, in the material studied, reach a maximum mean diameter of 29 mm (NMV P 22988). Hill (1939a, p. 247, however, examined a specimen having a diameter of as much as 34 mm. The longest specimen seen (NMV P 22994), although incomplete both proximally and distally, is 85 mm in length. Rejuvenescence occurs, but in most cases the resultant change in diameter is slight.

The calice is not known at the present time. Longitudinal sections suggest that it is steep-sided and has an axial boss. The exterior of the epitheca bears faint septal grooves and abundant fine growth striae.

The wall is variable, in some specimens it consists of an epitheca which is confluent with the peripheral part of the septa, and is less than 1 mm thick. In others the epitheca is supplemented by a septal stereozone forming a wall up to 2 mm thick. Hill's material suggested that the peripheral septal dilation decreases as the height of the corallum increases and that no continuous stereozone is present in later stages. However, a study of more abundant material has not confirmed this; but it does reveal that a peripheral stereozone is most likely to be developed in individuals having a large number of septa relative to the diameter.

The septa are radially arranged and well differentiated into two orders. Details of the septa and wall are summarized in the following table (measurements in mm):

Specimen	Mean diameter	No. of septa	Wall thickness	Stereozone
NMV P 22998	15	34 × 2	eroded	absent?
NMV P 22989	18	32 × 2	0·6	absent
NMV P 23007	20	32 × 2	0·8	absent
NMV P 22998	20	33 × 2	eroded	absent?
NMV P 22992	20	33 × 2	0·4 and 0·8	present in part
NMV P 22990	20	36 × 2	1·8	present
NMV P 23007	23	33 × 2	0·8	absent
AM F1242	23	38 × 2	2·0	present
NMV P 22991	25	38 × 2	0·7	absent
NMV P 23001	26	36 × 2	0·8	absent
NMV P 23000	27	39 × 2	1·9	present
NMV P 22988	29	35 × 2	0·5	absent

Both major and minor septa are faintly carinate and dilated in the dissepimentarium. The major terminate at or near the axis, and in the tabularium are thin and wavy, so that the interseptal loculi vary considerably in width. The minor septa are normally one-third to one-half the length of the major and may either just project into the tabularium or be confined to the dissepimentarium. The trabeculae are inclined at a very low angle to the horizontal and in some cases are almost normal to the wall.

Although variable, the dissepiments, on the whole, are numerous and relatively small. They may be coated with sclerenchyme and in some transverse sections (NMV P 23000 and P 23001) a prominent ring of sclerenchyme is developed in the central part of the dissepimentarium. There is a tendency for the dissepiments to cross the interseptal loculi obliquely, but this never leads to the formation of a herringbone dissepimentarium.

Tabellae, which in some cases are difficult to distinguish from dissepiments, occur at the margin of the tabularium in most specimens. The tabulae are short and tend to be periaxially domed.

REMARKS: A specimen from the Kuznets Basin, figured by Bulvanker (1958, Pl. 3, fig. 2) as *Phaulactis cyathophylloides*, closely resembles *Sterictophyllum cresswelli* and there is little doubt that the species are congeneric. It is less close to *P. cyathophylloides* Ryder, which has recently been restudied by Minato (1961, p. 55), but nevertheless suggests that *Sterictophyllum* was derived from *Phaulactis*.

Sterictophyllum vallatum nom. nov.

1962 *Mictophylllum* sp. affin. *M. cresswilli* Philip p. 180, Pl. 23, fig. 3, 4.

NAME DERIVATION: L. *vallatus* = walled.

MATERIAL: Holotype, UM thin sections 1543, 4 cut from the same coral.

DIAGNOSIS: Corallum ceratoid. Peripheral stereozone well developed in the holotype (2·5 mm wide). Septa withdrawn from the axis and numbering about 42 × 2 at 30·0 mm. Dissepiments small and numerous. Tabularium axially elevated and composed entirely of arched tabellae.

REMARKS: In spite of the paucity of the material, a name is proposed for this coral since it is clearly distinct from other described species.

It differs from *S. cresswelli* in its large size, shorter and more numerous septa, and by its relatively wider and more axially elevated tabularium. In the unique specimen, the peripheral stereozone is broader than in any known specimen of *S. cresswelli*; however, the width of the stereozone is expected to be variable.

S. pridianum, which occurs in the same limestone, is similar in some respects, but is subcylindrical and has longer and much more strongly carinate septa than *S. vallatum*.

Genus **Loomberaphyllum** nov.

NAME DERIVATION: Parish of Loomberah, and Gk φύλλον = leaf.

TYPE SPECIES: *Loomberaphyllum pustulosum* sp. nov., see below.

DIAGNOSIS: Corallum large, subcylindrical, generally elliptical, rather than circular, in transverse section. Septa long, but cardinal and some, or all of the other protosepta, are shorter than their adjacent major septa. Septa of both orders are smooth or nearly so; towards the periphery they become progressively more dilated and tend to split into two or three separate lamellae. Trabeculae parallel and set at a low angle to the horizontal. Dissepiments relatively small, numerous, forming a broad dissepimentarium; dilation of the septa may spread to the dissepiments, especially near the periphery. Tabularium elevated axially and composed of numerous, mostly arched tabellae.

ADDITIONAL SPECIES ASSIGNED: *Loomberaphyllum impensum* nom. nov., see below.

COMPARISONS: *Loomberaphyllum* is distinguished from *Sterictophyllum* by its shortened protosepta and by the tendency for its septa to split peripherally.

The coral described as *Radiophyllum arborescens* from the Mt Etna Limestone (Emsian) of Queensland (Hill 1942a, p. 17, 18, Pl. 1, fig. 7) has features in common with both *Loomberaphyllum* and *Sterictophyllum* and is almost certainly a sterictophyllid. Since *Entelophyllum arborescens* Hill and Jones (1940, p. 188, Pl. 3, fig. 5) is the type species of *Radiophyllum* Hill (1942a, p. 17), it might

appear that the two new genera are close to *Radiophyllum*, but this is probably not so. Strusz (1963), who has had the opportunity of collecting additional topotypes of *R. arborescens* from the Lower Devonian Garra Beds of N.S.W., maintains that it is close to *Entelophyllum* and is not conspecific with the Queensland specimen.

The way in which the septa split peripherally in *Loomeraphyllum* is reminiscent of the cyathophyllids. In the Cyathophyllidae, however, the trabeculae are steeply inclined and the radial symmetry is more pronounced, since the protosepta are indistinct in adult stages.

Loomberaphyllum pustulosum sp. nov.

(Pl. 32, fig. 8, 9; Pl. 34, fig. 7, 9)

1942b *Mictophylllum* cf. *cresswelli* (Chapman) Hill, p. 159, Pl. 3, fig. 9.
non 1925 *Cyathophylllum cresswelli* Chapman, p. 111, 112, Pl. 13, fig. 11-14.

NAME DERIVATION: L. *pustulosus* = full of pustules.

MATERIAL: Holotype, UNS F8796. Loomberah Limestone (late Emsian or early Eifelian), Portion 58, Parish of Loomberah, County of Parry, N.S.W.

DIAGNOSIS: Corallum subcylindrical, large, typically 50 to 55 mm in diameter. Except for the cardinal, counter and four other septa (also protosepta?), which are shorter, the major septa extend to the axial region. Septa of both orders are dilated in the dissepimentarium; peripherally the major tend to split into more than one lamella. Septal counts 51 × 2 to 53 × 2 in known specimens. Dissepiments small and numerous. Sclerenchymal investment of both septa and dissepiments is common at the periphery. Tabularium broadly domed and entirely constituted of small arched tabellae.

DESCRIPTION: The holotype is a subcylindrical fragment of a large solitary coral, which before sectioning was about 50·0 mm long and 48·0 mm in mean diameter. It was completely embedded in matrix and had been eroded prior to fossilization.

A small part only of the epitheca is preserved; it is 1·0 mm thick. The septa appear to be embedded in the epitheca and are differentiated into two orders. Septal counts are as follows (measurements in mm):

Specimen	Mean diameter	No. of septa
US 7247, 7285	40-55	51 × 2
UNE F8696	48	53 × 2

The cardinal, counter and four other septa, which are so situated that they may also be protosepta, are relatively short. The remaining major septa extend in groups to the axial region where they are slightly twisted. The minor septa are about one-half the length of the major septa and typically terminate at the inner margin of the dissepimentarium. In the tabularium the septa are thin and smooth, but in the dissepimentarium those of both orders are dilated and weakly carinate. Near the periphery additional trabeculae may be developed on the major septa and vacuoles may appear along the median plane of the septa. Also near the periphery the septa may be invested with light coloured lamellar sclerenchyme which spreads to the dissepiments. The trabeculae are very flat lying, making an angle of up to only 10° or 15° with the horizontal.

The dissepimentarium is broad and consists of about 20 rows of small globose dissepiments. Lateral dissepiments occur near the periphery.

There are no tabulae; the tabularium is composed entirely of small arched tabellae. At the margin these are flat or outwardly sloping, but towards the axis they become horizontal so that the tabularium is broadly domed. Thin sclerenchyme invests many of the tabellae.

REMARKS: Although the specimen from the Loomberah Limestone described by Dun (in Benson 1918, p. 376, 377, Fig. 4) as *Cyathophyllum* sp. shares some features with *L. pustulosum*, it has more numerous septa and is probably a distinct species.

Loomberaphyllum impensum nom. nov.

(Pl. 34, fig. 10)

1962 *Acanthophyllum clermontensis* (Etheridge) Phillip, p. 185, 186, Pl. 27, fig. 1, 2.
non 1911 *Cyathophyllum* (?) *clermontensis* Etheridge, p. 5, 6, Pl. B, fig. 1, 2; Pl. D, fig. 3.

NAME DERIVATION: L. *impensus* = great.

MATERIAL: Holotype, UM 3037 from which two thin sections have been prepared—TS 1599 and TS 1600. This was collected from a limestone in the Coopers Creek Formation (late Gedinnian or Siegenian) on Tyers R., Vict.

REMARKS: The holotype has been described and figured by Philip. The main difference between it and *Acanthophyllum clermontense*, which has been redescribed by Hill (1939b, p. 57, 58, Pl. 4, fig. 1, 2), lies in the tabularium. In *A. clermontense* the tabulae are normal for the genus, that is to say, they are close-set and are depressed axially; in *L. impensum*, on the other hand, they tend to be convex and are elevated axially. Furthermore, the protosepta are not discernible in *A. clermontense* as they are in *L. impensum*.

Loomberaphyllum pustulosum is a smaller species with more uniformly convex tabellae and fewer lateral dissepiments.

Family CYATHOPHYLLIDAE Dana

Genus **Cavanophyllum** nov.

NAME DERIVATION: Cavan Station, and Gk φύλλον = leaf.

TYPE SPECIES: *Mictophyllum trochoides* Hill, see below.

DIAGNOSIS: Corallum large, solitary. Septa long, weakly rotated at the axis, thin and smooth or faintly carinate, except near the periphery where, due to trabecular deviation, subsidiary lamellae, dilation, pronounced carinae, and internal spaces are developed. Dissepiments abundant. Tabulae incomplete forming a broadly domed tabularium.

COMPARISONS: Birenheide (1963) has provided new descriptions of several genera and species related to *Cavanophyllum trochoides*. In the light of his work, *Cavanophyllum* is distinguished from *Cyathophyllum* Goldfuss (1826, p. 54) by its long, axially rotated septa containing almost spherical vacuoles, and by its centrally domed tabularium. The type species are further distinguished by their growth form, although Birenheide includes both solitary and colonial forms in *Cyathophyllum*.

Peripaedium Ehrenberg (1834, p. 384) and the synonymous genera *Keriophyllum* Wedekind (1923, p. 27, 34) and *Ceriophyllum* Lang, Smith and Thomas (1940, p. 35), resemble *Cavanophyllum*. They are distinguished by their septa, which peripherally, are thin and very much less modified.

Tipheophyllum Hill (1956a, p. 9) is probably the closest described genus to

Cavanophyllum. The septa in *Tipheophyllum ops* Philip from the Coopers Creek and Lilydale Limestones strongly resemble those of *C. trochoides*. The genera are distinguished by the phaceloid growth form and more uniform carinae in *Tipheophyllum*.

Mictophyllum differs from the new genus in several respects, but is most easily distinguished by its unmodified septa.

Cavanophyllum trochoides (Hill 1940)

(Pl. 33, fig. 7-10; Pl. 34, fig. 5, 8, 11, 12)

1940 *Mictophyllum trochoides* Hill, p. 265, 266, Pl. 11, fig. 7-10.

MATERIAL: Holotype, AM F17110, probably from the Cavan Bluff Formation (Siegenian) at Cavan, near Taemas on the Murrumbidgee R., N.S.W. Paratypes, UQ F4221, F4222, Cavan Bluff Formation, Clear Hill, near Taemas, and UQ F4260, same formation on Wee Jasper Rd 0·5 mile from Taemas Bridge (1937), N.S.W. Hypotypes 1-3, UNE F8782-8784, Cavan Bluff Formation, Clear Hill, near Taemas. Hypotype 4, UNE F8785, limestone containing the Cavan Bluff fauna (e.g. *Zelolasma gemmiforme* and *Tipheophyllum bartrumi*), E. of the bridge over the Goodradigbee R. at Wee Jasper, N.S.W.

DIAGNOSIS: Corallum trochoid to cylindrical, up to 50 mm in diameter. Septa long, smooth to faintly carinate, radially arranged; at maturity, septal counts vary from about 37 × 2 to 46 × 2 and there is a strong tendency peripherally for the septa to split into separate lamellae; these may re-unite leaving internal spaces in the septum. Dissepiments relatively small, abundant, and periodically invested with thin sclerenchyme. Tabulae incomplete forming a broadly domed tabularium.

DESCRIPTION: The corallum is trochoid to cylindrical; the largest seen to date (UNE F8782) was obviously very incomplete, yet before sectioning had a mean diameter of about 50 mm and a length of 60 mm. The specimens collected so far are either eroded or embedded in matrix, or both, and no details of the exterior of the coral are available. Longitudinal sections suggest that the calice is steep-sided and that there is no peripheral platform.

The epitheca is variable, but generally thin.

The septa are radially arranged and clearly differentiated into two orders. They are smooth, or faintly carinate, and thin, except in the outer part of the dissepimentarium where they are dilated. The peripheral parts, in ephebic and gerontic stages, are commonly broken into separate lamellae, which may re-unite leaving internal spaces. Septal counts are as follows (measurements in mm):

Specimen	Mean diameter	No. of septa
AM F17110	22	38 × 2
UNE F8783	27	36 × 2
UNE F8784	28	37 × 2
UNE F8784	34	41 × 2
UNE F8783	38	37 × 2
UNE F8785	40	38 × 2
UQ F4221	45	42 × 2
UNE F8782	48	46 × 2

The major septa are unequally long and typically terminate near the axis; in many specimens they form a weak axial vortex. The minor septa are as well

developed as the major in the dissepimentarium, but either fail to enter the tabularium, or only just project into it. The trabeculae lie at an angle of about 35° to the horizontal in the disseptimentarium, but tend to steepen slightly on entering the tabularium. Due to the peculiar break up of the septa, the trabeculae, in places, appear to be discrete in transverse sections.

The dissepiments are numerous and small relative to the size of the corallum. As seen in transverse section they are commonly chevron-shaped, or cross the interseptal loculi obliquely and, particularly in the peripheral region, may abut against a more peripherally situated dissepiment rather than a neighbouring septum. At intervals they are coated with a thin layer of sclerenchyme. The width of the dissepimentarium is about one-half the radius of the tabularium.

The tabulae are close-set and incomplete; in most specimens the tabularium is broadly domed.

REMARKS: At the present time, this is the only species referred to the genus. A few species of *Cyathophyllum* from the Eifelian of Germany, such as *C. degener* (Haller 1936, p. 620, Pl. 36, fig. 2) and *C. spongiosum* (Schulz 1883, p. 237, Pl. 21, fig. 8) have features in common with *Cavanophyllum trochoides*, but are distinguished by their size, or septal counts, as well as by the criteria cited as distinguishing the genera.

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Explanation of Plates

L.S. and T.S. are the abbreviations used throughout for longitudinal and transverse sections respectively.

PLATE 30

All figures × 1·5

Fig. 1, 3-5—*Chalcidophyllum campanense* var. *nanum* gen., sp. et var. nov. (1) UNE F8793, Paratype 7, L.S.; (3, 5) UNE F8792, Paratype 6, T.S.; (4) UNE F8792, Paratype 6, L.S. Both from the Bell Point Limestone, Vict.

Fig. 2, 6-13—*Chalcidophyllum campanense* gen. et. sp. nov. (2) UNE F8787, Paratype 1, L.S.; (6) UNE F8786, Holotype, L.S. of corallite on the left of 11; (7) UNE F8788, Paratype 2, L.S.; (8) UNE F8786, Holotype, T.S.; (9) UNE F8790, Paratype 4, T.S.; (10) UNE F8787, Paratype 1, L.S. of same corallite as fig. 13; (11) UNE F8786, Holotype, T.S.; (12) UNE F8786, Holotype, L.S. of corallite in centre of fig. 11; (13) UNE F8787, Paratype 1, T.S. All from the Bell Point Limestone, Vict.

Fig. 14, 15—*Chalcidophyllum discorde* gen. et sp. nov. (14) UNE F8795, Holotype, L.S.; (15) UNE F8795, Holotype, T.S.

PLATE 31

All figures × 1·5

Fig. 1-5—*Stathmoelasma amplum* gen. et sp. nov. (1) UNE F8779, Paratype 1, T.S.; (2) UNE F8778, Holotype, T.S.; (3) UNE F8780, Paratype 2, T.S.; (4) UNE F8778, Holotype L.S.; (5) UNE F8780, Paratype 2, L.S. All from the upper part of the Sulcor Limestone, N.S.W.

PLATE 32

All figures × 1·5

Fig. 1-7, 11—*Stereotophyllum cresswelli* (Chapman) gen. nov. (1) NMV P 22990, Hypotype, T.S.; (2) NMV P 23000, Hypotype, T.S.; (3) NMV P 23007, Hypotype, T.S.; (4) NMV P 22992, Hypotype, T.S.; (5) NMV P 23000, Hypotype, L.S.; (6) NMV P 23007, Hypotype, T.S.; (7) NMV P 22991, Hypotype, L.S.; (11) NMV P 22990, Hypotype, L.S. All topotypes from the Lilydale Limestone, Vict.

Fig. 8, 9—*Loomberaphyllum pustulosum* gen. et sp. nov. (7) UNE F8796, Holotype, T.S.; (8) UNE F8796, Holotype, L.S. Loomberah Limestone, N.S.W.

Fig. 10—*Stathmoelasma amplum* gen. et sp. nov., UNE F8779, Paratype 1, L.S. Upper part of the Sulcor Limestone, N.S.W.

PLATE 33

All figures × 1·5

Fig. 1-6—*Stereotophyllum cresswelli* (Chapman) gen. nov. (1) NMV P 22998, Hypotype, T.S.; (2) NMV P 23007, Hypotype, T.S.; (3) NMV P 22989, Hypotype, T.S.; (4) NMV P 22991, Hypotype, T.S.; (5) NMV P 22988, Hypotype, T.S.; (6) NMV P 23001, Hypotype, T.S. All topotypes from the Lilydale Limestone, Vict.

Fig. 7-10—*Cavanophyllum trochoides* (Hill) gen. nov. (7) UNE F8784, Hypotype, L.S.; (8) UNE F8782, Hypotype, T.S.; (9) UNE F8784, Hypotype, T.S.; (10) UNE F8783, Hypotype, L.S. All topotypes from the Cavan Bluff Limestone, N.S.W.

PLATE 34

All figures × 5

Fig. 1—*Chalcidophyllum discorde* gen. et sp. nov. UNE F8795, Holotype, T.S. Bell Point Limestone, Vict.

Fig. 2—*Chalicodphyllum campanense* gen. et sp. nov. UNE F8786, Holotype, T.S. Bell Point Limestone, Vict.

Fig. 3, 4—*Stereotophyllum cresswelli* (Chapman) gen. nov. (3) NMV P 22992, Hypotype, T.S. of a specimen lacking a stereozone; (4) NMV P 23000, Hypotype, T.S. of specimen possessing a stereozone. Both topotypes from Lilydale Limestone, Vict.

Fig. 5, 8, 11, 12—*Cavanophyllum trochoides* (Hill) gen. nov. (5) UNE F8784, Hypotype, tangential section near the periphery; (8) UNE F8782, Hypotype, tangential section near the periphery; (11) UNE 8784, Hypotype, T.S. All near topotypes from the Cavan Bluff Limestone, N.S.W. (12) UNE F8785, Hypotype, T.S. Limestone containing the fauna of the Cavan Bluff Formation at Wee Jasper, N.S.W.

Fig. 6—*Stereotophyllum pridianum* (Philip) gen. nov. UM 3039, TS 1613, Holotype, T.S. Limestone in the Coopers Creek Formation, Vict.

Fig. 10—*Loomberaphyllum impensum* nom. nov. UN 3037, TS 1599, Holotype, T.S. Limestone in the Coopers Creek Formation, Vict.